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BIOMORPHIC ROBOTIC SYSTEMS & THEIR MISSION APPLICATIONS

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Biomorphic Robotic systems constitute a new paradigm in mobile explorers that capture key features and mobility attributes of biological systems, to enable new scientific endeavors. The general premise of biomorphic systems is to distill the principles offered by natural mechanisms to obtain the selected features/functional traits and capture the biomechatronic designs and minimalist operation principles from nature's success strategies. Biomorphic explorers are a unique combination of versatile mobility controlled by adaptive, fault tolerant biomorphic algorithms to autonomously match with the changing ambient/terrain conditions. Significant scientific payoff at a low cost is realizable by using the potential of a large number of such cooperatively operating biomorphic systems. A classification of these with example candidates in each category will be presented. The biomorphic flight systems are extremely attractive for solar system exploration because of their potential large range, unique imaging perspective, and the access to here-to fore inaccessible sites that they would provide. Biomorphic Missions are co-operative missions that make synergistic use of existing/conventional surface and aerial assets along with biomorphic robots. Specific science objectives targeted for these missions include close-up imaging for identifying hazards and slopes, assessing sample return potential of target geological sites, atmospheric information gathering by distributed multiple site measurements, and deployment of surface payloads such as instruments/biomorphic surface systems or surface experiments. A few mission scenarios enabled by biomorphic robotic systems will be described.

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